Example of a Soil Screening Level Assessment using the Terrestrial Toxicity Database (Example No. 6)

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Contents

Introduction

The U.S. Army Engineer Research and Development Center (ERDC) is developing the Army Risk Assessment Modeling System (ARAMS) to provide the Army with the capability to perform human and ecologically based risk/hazard assessments associated with past practice and current activities at military installations. The intent of the system is to provide a platform from which a variety of assessments can be performed. The system is envisioned to help a risk analyst visualize an assessment from source, through multiple environmental media (e.g., groundwater, surface water, air, and land), to sensitive receptors of concern (e.g., humans and ecological endpoints).

ARAMS uses the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES) developed by the Pacific Northwest National Laboratory (PNNL) for linking disparate objects, such as environmental fate/transport models, databases, spreadsheets, etc. FRAMES is a Windows-based software platform that provides an interactive user interface and, more importantly, specifications to allow a variety of DOS and Windows-based environmental codes to be integrated within a single framework.

This document is intended to serve as a tutorial for helping new users with the application of ARAMS/FRAMES and the components within this system. This example does not include the steps for project planning and the use of associated tools under the "File" menu. These tools help the user plan the risk assessment including development of the conceptual site model and the RAGS Part D Table 1 for human health risk assessment. There are several Help files within ARAMS that explain these tools.

Example Description

This case will use "measured" time-varying soil concentrations with soil screening-level (SSL) benchmarks to conduct an ecological screen. The measured soil values are entered using the User Defined object and the SCF Soil Module. SSL benchmark values are obtained from the Terrestrial Toxicity Database (TTD). These values are then used by the Wildlife Ecological Assessment Program (WEAP) to determine the screening-level eco hazard quotient (EHQ) values, where in this case, EHQ is actually the soil concentration divided by SSL, where a value greater than 1.0 indicates that the constituent may pose a concern and warrants further study. WEAP is a software package that summarizes ecological health impacts to various organisms from exposures to constituents.

The FRAMES working space will look like Figure 1 when completed.

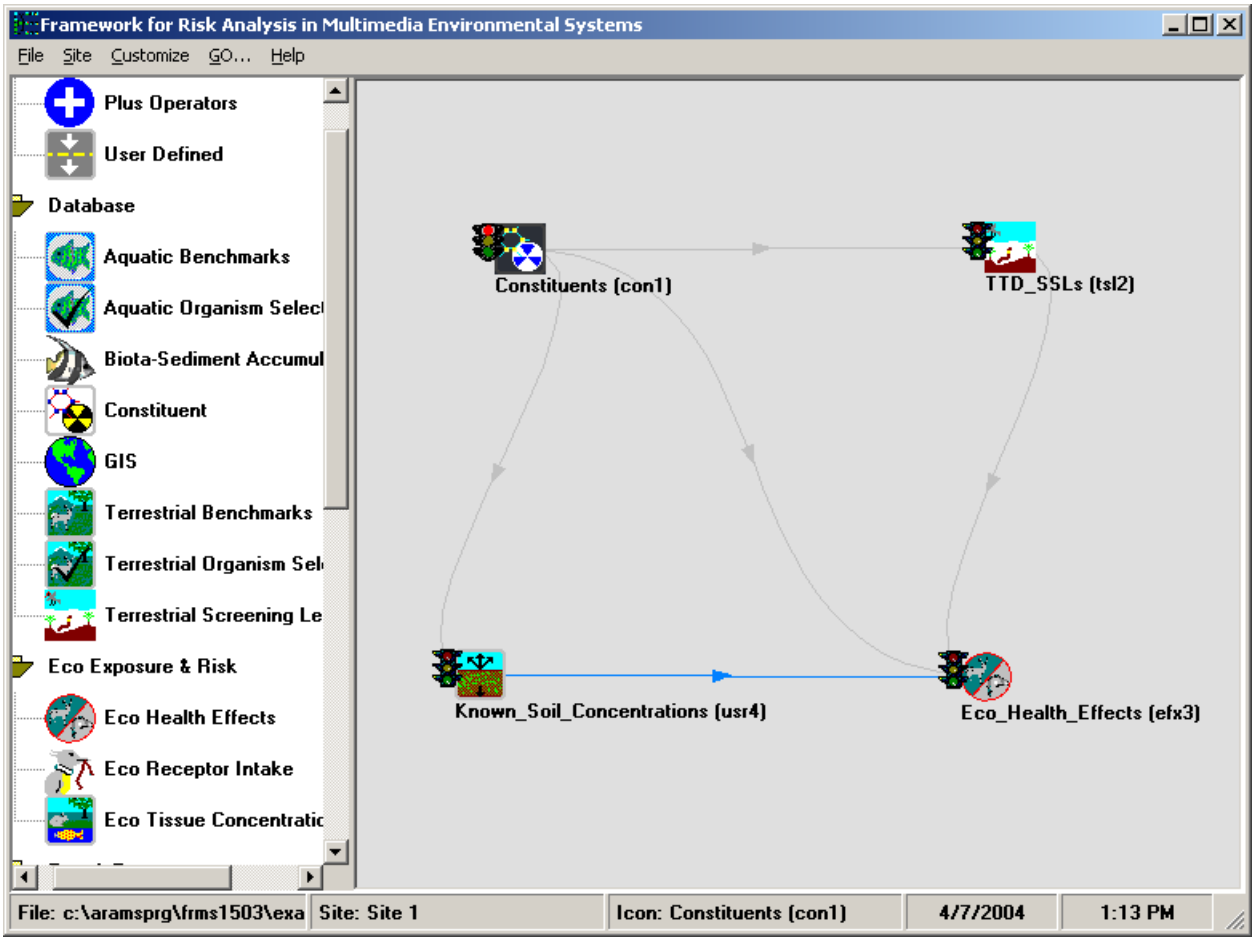

Figure 1. Object workspace for example application

Input Data

- Double-click on "ARAMS Icon" to open "ARAMS info and Disclaimer" window and then select "Accept" to continue.

- Choose "FRAMES" in the ARAMS toolbar to launch FRAMES. (Note: If this is the first time you have used ARAMS, you will need to configure it for FRAMES by selecting "**File**" "*****Must Configure Path to FRAMES*****" and supplying the path to the "**fui.exe**" file).

- While ARAMS/FRAMES is running, click "File" and choose "New" and a window titled "Global Input Data Open New" will appear (see Figure 2). In the "File Name" box, type the project name (type: "Sample*3*," maximum of 8 characters) and click "Open" (see Figure 3). **Do not name the new file "Example6" because it will write over the existing "Example6" file that was dis-**

tributed with the tutorial. A window titled "Create New Site" will appear. Type the project site name (type: Brownfield Site) and click "OK" (see Figure 4).

The workspace's color may change. Double-click on the Constituent icon so that the icon appears on the upper left corner of the main screen. Repeat this operation to place the following additional icons into the workspace:

"*User Defined"*
"Terrestrial Screening Levels"
"*Eco Health Effects"*

Click on and drag each icon to its respective position on the workspace. Connect the Constituent icon with the User Defined icon by holding down SHIFT, left-clicking on the Constituent icon, dragging the cursor to the User Defined icon, and releasing the mouse button (Note: To remove this line, repeat the steps used to connect it. To remove an icon from the screen, right-click and a menu will appear with different options. Click "Delete" and the icon will be taken out.).

In the same fashion, connect the following pairs of icons:

Constituent	→	*User Defined (already done)*
Constituent	→	*Terrestrial Screening Levels*
Constituent	→	*Eco Health Effects*
User Defined	→	*Eco Health Effects*
Terrestrial Screening Levels	→	*Eco Health Effects*

FRAMES should now look something like Figure 1.

CONSTITUENT DATABASE MODULE

Right-click the Constituent icon and choose General Info (see Figure 5). When the General Info screen opens, enter "Constituents" in the "User Label" text box and select "FRAMES Default Chemical Database Selection" in the "Select from applicable models" text box (see Figure 6). Click OK at the bottom of the screen to return to the workspace area. The status light attached to the constituent icon will change from black to red. Right-click on the constituent icon in the main screen and choose User Input. The Constituent Selection screen will open (see Figure 7). The constituent used in this case is 1,1 Dichloroethylene. Scroll to select the constituent from the constituents list or use the Find option to search for it. Click the "Add >>>" button to add the constituent to the selected constituents list. Click "File" and choose "Save and Exit" to return to the workspace screen. The Constituent icon's status light will change from red to green.

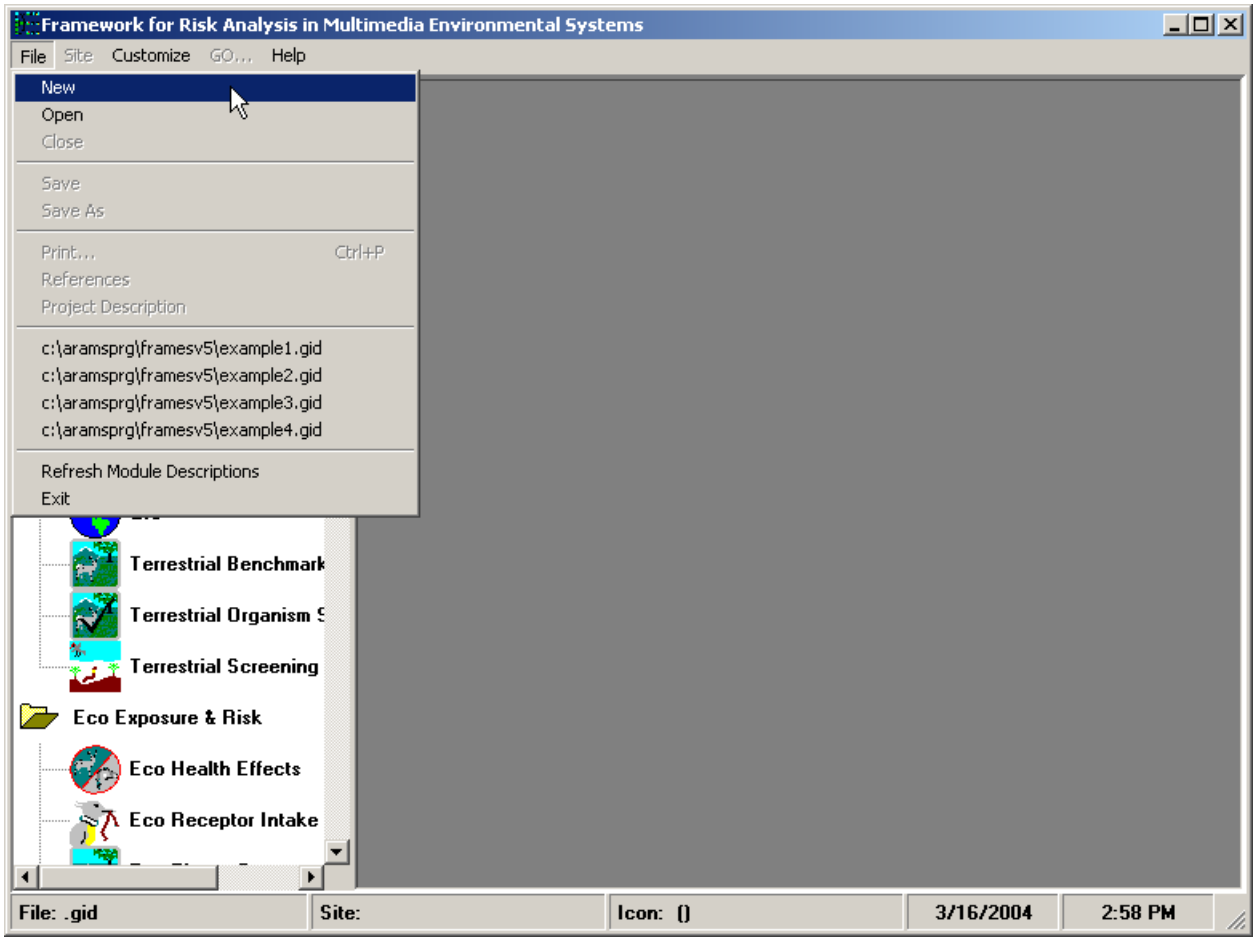

Figure 2. Opening a new file

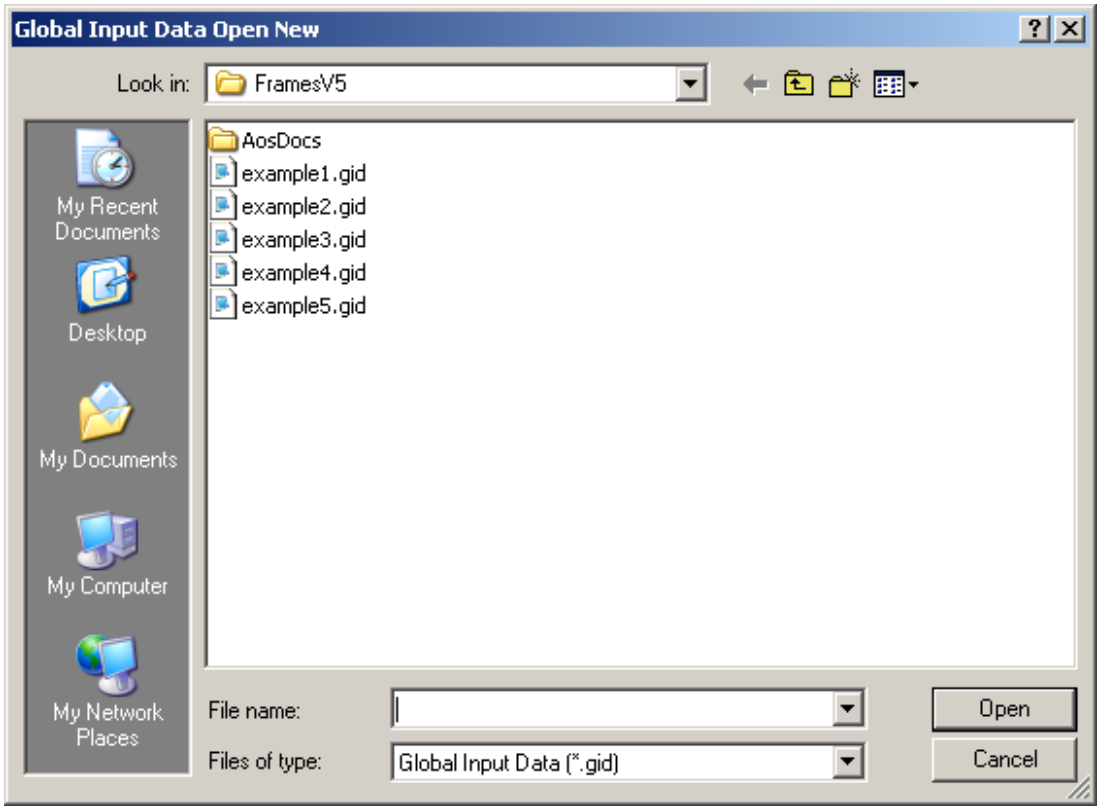

Figure 3. Global Input Data Open New screen (new file window)

Figure 4. Create New Site screen (input “Site name” box)

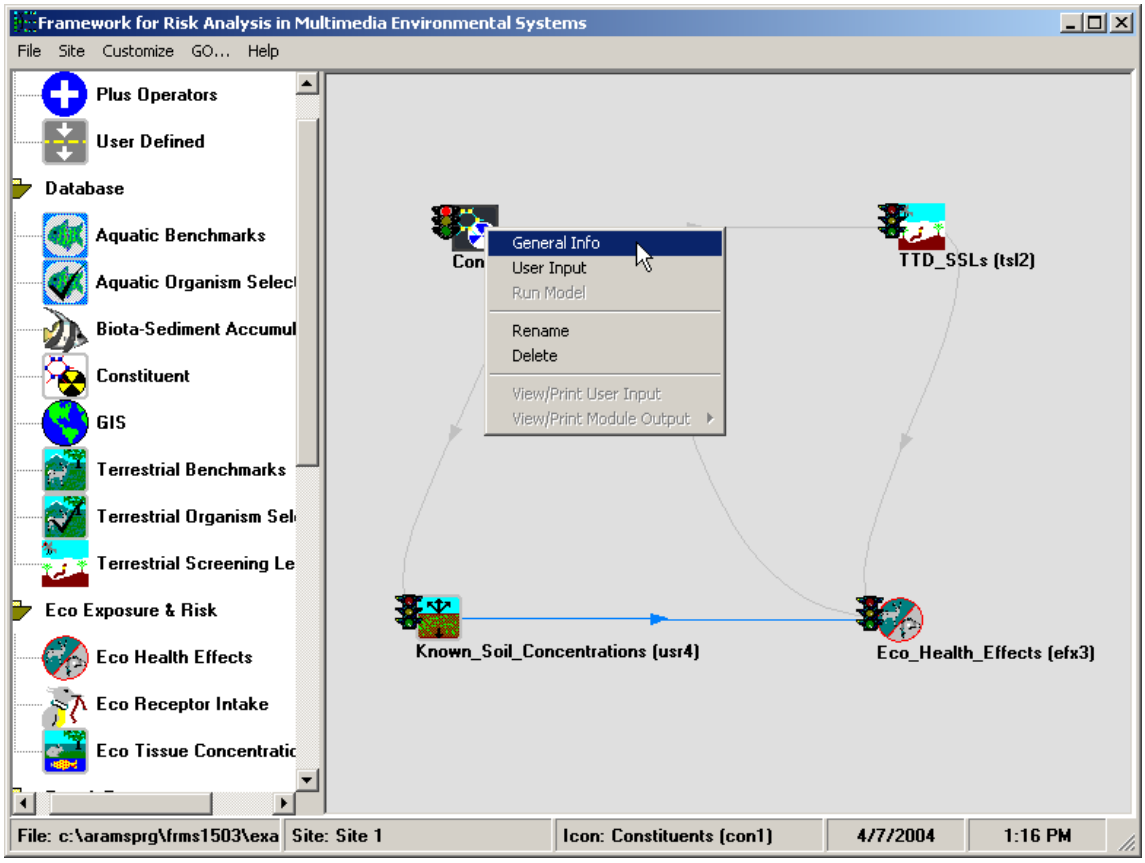

Figure 5. Workspace screen (right-click on the Constituent icon)

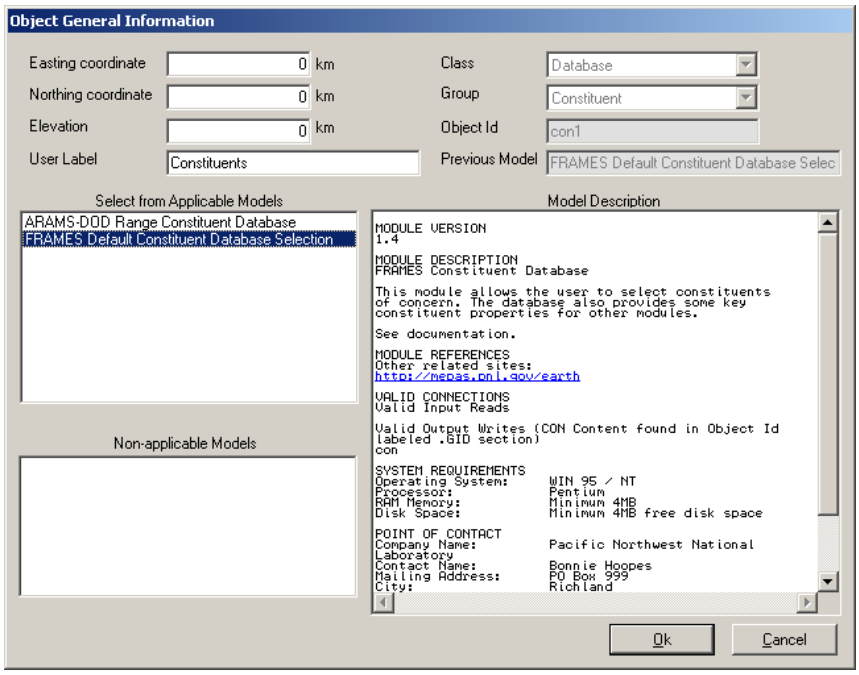

Figure 6. Object General Information screen

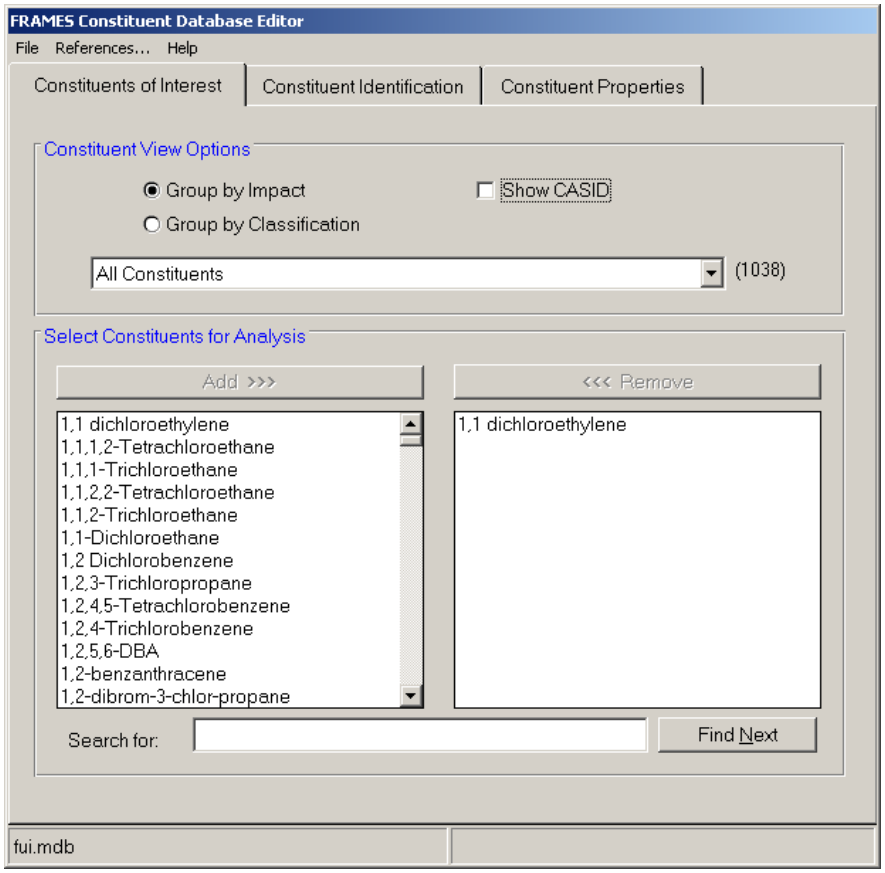

Figure 7. FRAMES Constituent Selection screen ("Constituents of Interest" tab)

The following is a listing of all data input required by the remaining modules used in this example. *Names of object icons* are in bold, italics, and underlined headings. *Menu items* (displayed by right-clicking on the icon) are shown below the module in bold and indented to the right of the icon names. *Explanations* of data required by each menu item are indented further to the right. To save information for a scenario, select "File" and then "Save" from the main FRAMES menu.

For ease of presentation, the instructions below proceed with selecting module, entering data, running the module, and viewing module output. However, the user should select all object modules prior to entering data for each module.

USER DEFINED

General Info

A window titled "Object General Information" will appear. In the Label text box, put in "Known_Soil_Concentrations." In "Select from Applicable Models," choose "SCF Soil Module" and click "Ok." The status light next to the User Defined icon should turn red. Note that the User Defined icon will now also change to that of a Source object to reflect the type of module that was chosen.

User Input

A window titled “FRAMES User Defined Module” will appear. This module will be used to enter the known time-varying soil concentrations for 1,1-dicholoroethylene. Enter the data given below and shown in Figure 8.

Time (yr)	Concentration (mg/kg)
0	125
10	250

Choose “Save and Exit” from the File menu to return to the work screen. The status light next to the User Defined icon should turn yellow.

Run Model

The model runs in the background. The status light next to the User Defined icon should turn green.

View/Print Module output

A second menu will appear (see Figure 9). Select “SCF Text View” to view a screen output like Figure 10. Choose “SCF Graphical View” to view a screen output in Excel format (see Figure 11).

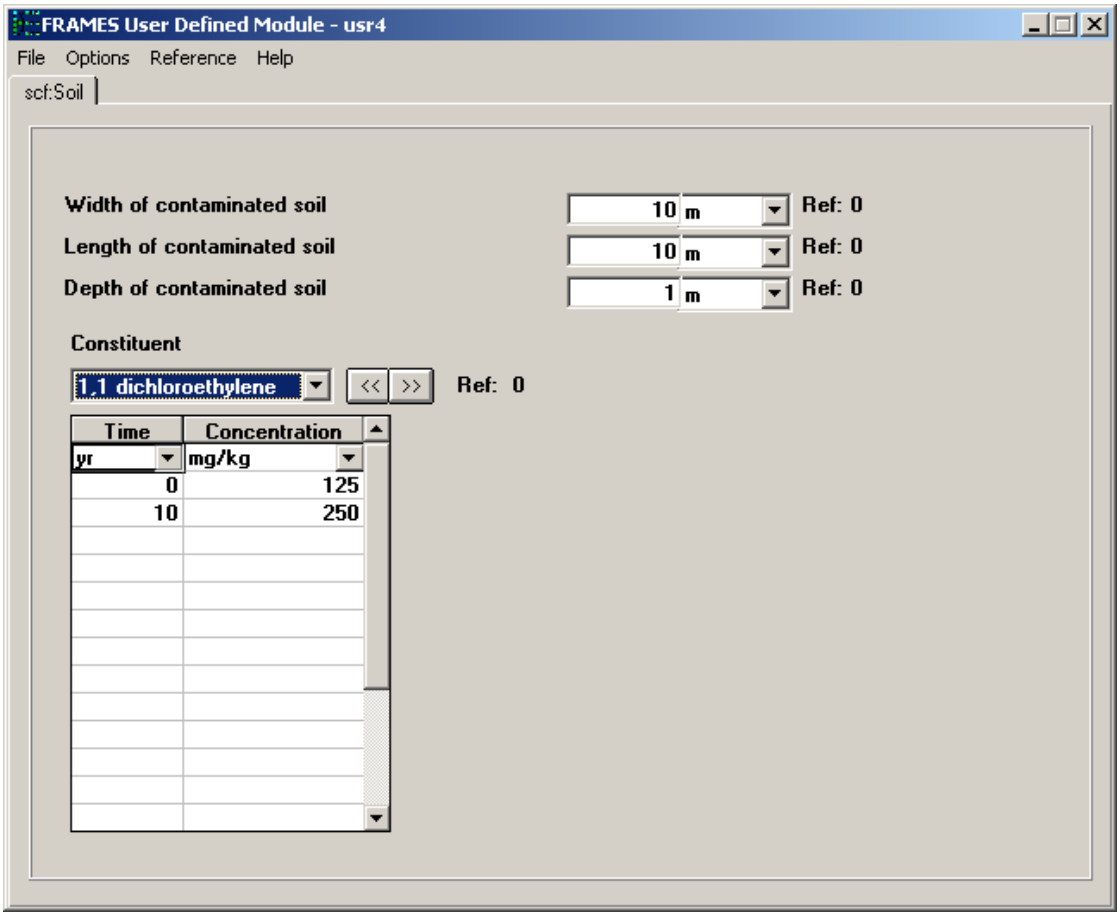

Figure 8. SCF Soil Module User Input screen

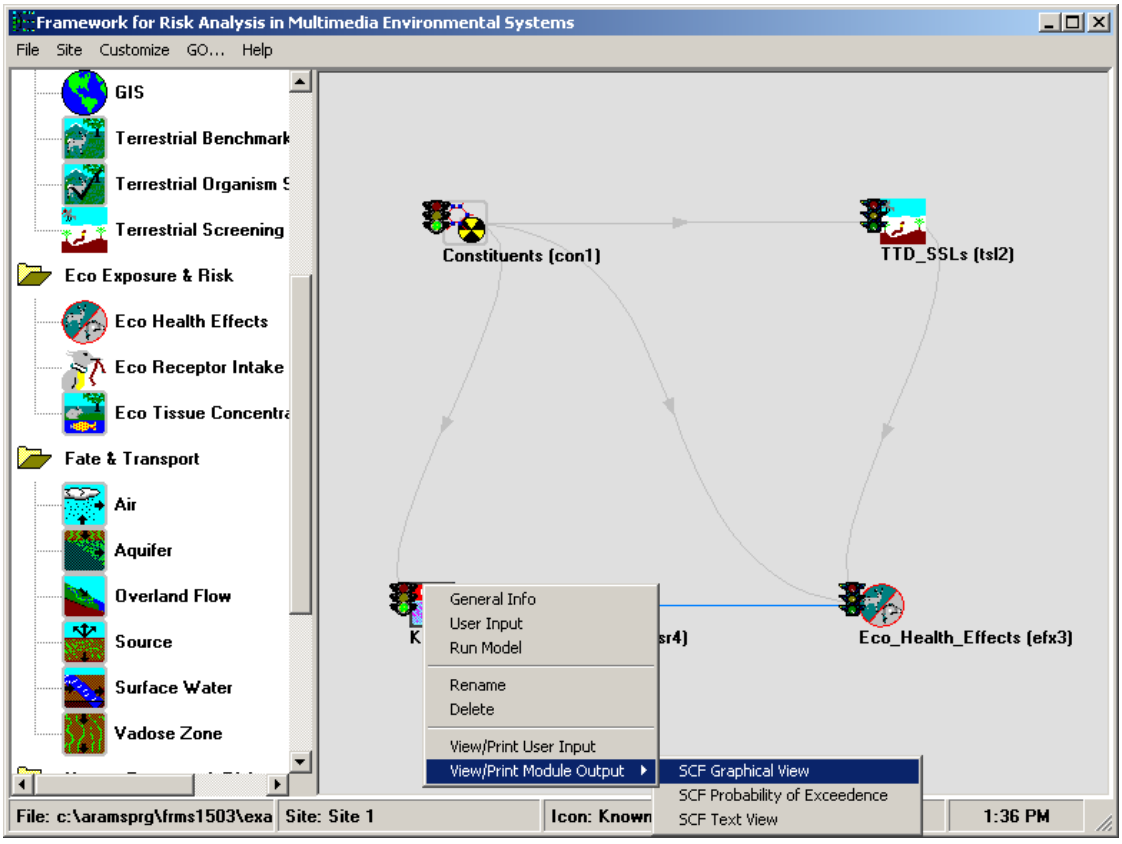

Figure 9. Selecting the Output display format

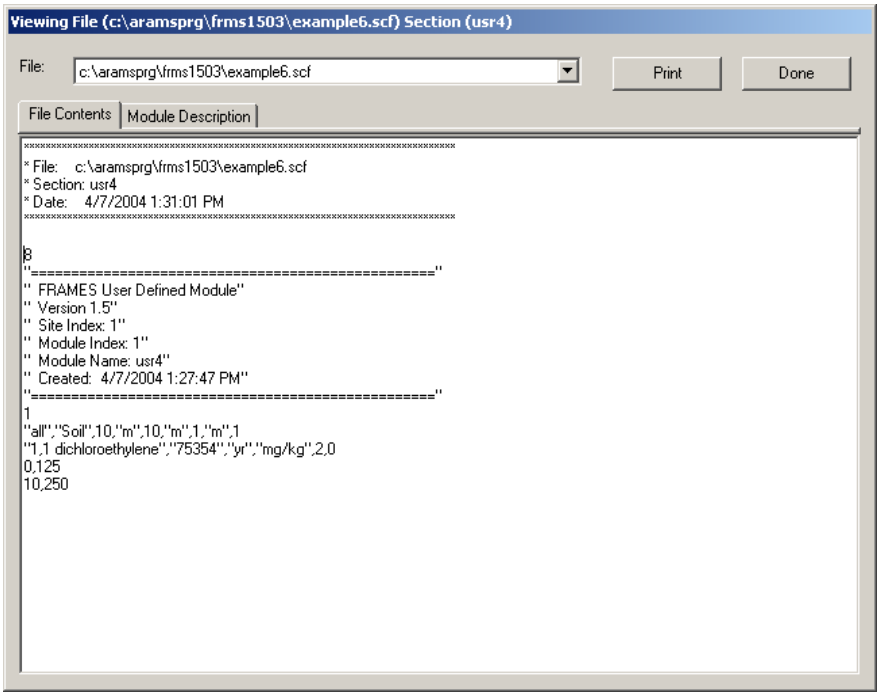

Figure 10. SCF text view

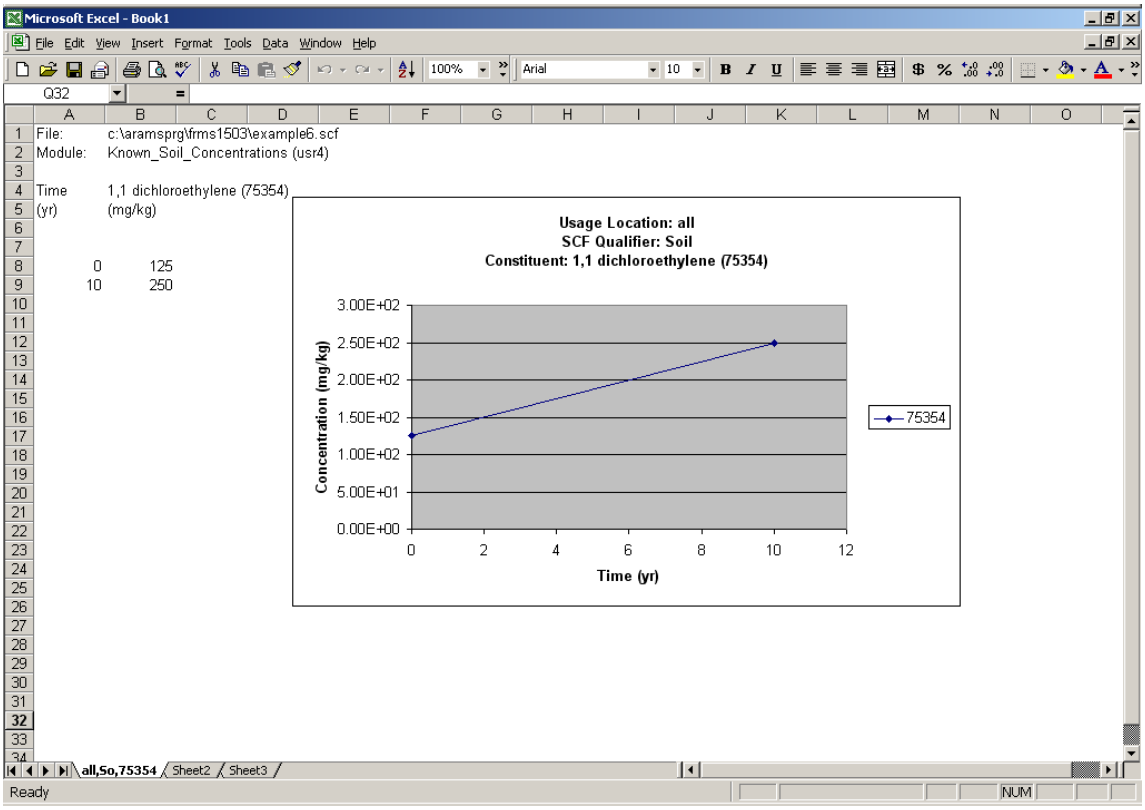

Figure 11. SCF Soil Module Output (Excel format view)

TERRESTRIAL SCREENING LEVELS

General Info

A window titled "Object General Information" will appear. In the Label text box, input "TTD - SSLs." In "Select from Applicable Models," choose "TTD - SSLs" and click "Ok." The status light next to the Terrestrial Screening Levels icon should turn red.

User Input

Click the button labeled "Get Data" at the right side of the form. The list of constituents will be loaded from the TTD database (Figure 12). Next click the button labeled "Auto Alias" to automatically alias the selected chemical to a chemical in the TTD database. If one or more of the constituents being used was not available in the TTD database, the user would need to select a valid alias for the constituent from the list at the right of the screen and then click the button labeled "Alias" to manually alias the constituent. Select the second tab labeled "Jurisdictions" at the top of the screen and choose "MHSPE" from the list at the left of the screen. Click the button labeled "Query Database," and the available data will be loaded into a list at the bottom of the screen (Figure 13). Select the values to use by placing a check in the box in the last column of the list. Click "File," and choose "Save and Exit" to return to the workspace screen. The Terrestrial Screening Levels icon's status light will change from red to green.

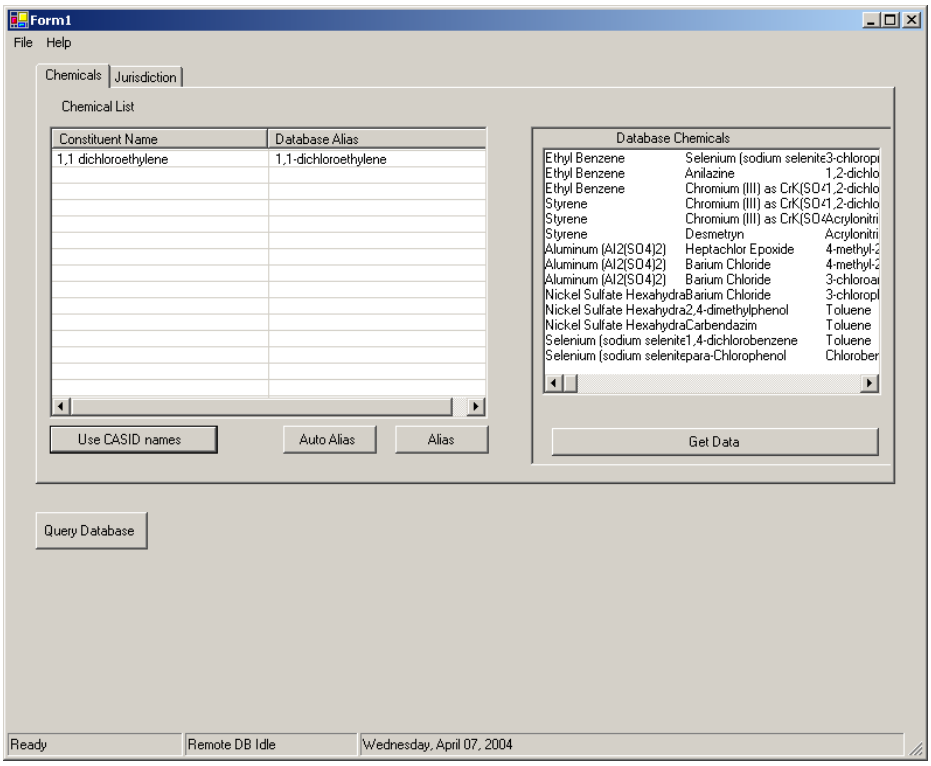

Figure 12. TTD-SSLs Main screen

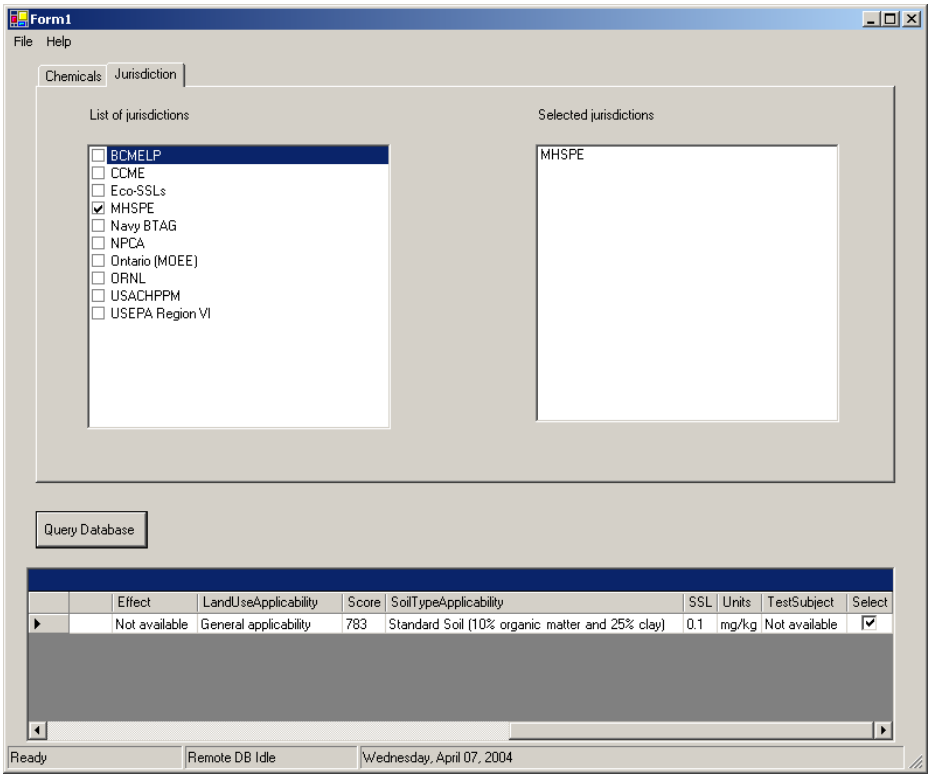

Figure 13. TTD-SSLs Jurisdiction Selection and Data Retrieval

ECO HEALTH EFFECTS

General Info

A window titled "Object General Information" will appear. In the Label text box, input "Eco Health Effects." In "Select from Applicable Models," choose "Wildlife Ecological Assessment Program" and click "Ok." The status light next to the Eco Health Effects icon should turn red.

User Input

A window titled "Wildlife Ecological Assessment Program" will appear. In the data tree on the left, click on "Soil Screen Level Jurisdictions" and a panel labeled "Soil Screening Level Jurisdictions" will appear at right. Select "MHSPE" as shown in Figure 14. Click "File," and choose "Save and Exit" to return to the workspace screen. The Eco Health Effects icon's status light will change from red to yellow.

Run Model

The model runs in the background. The status light next to the Eco Health Effects icon should turn green.

View/Print Module Output

A second menu will appear. Select the "EXF Text View" to view a screen output like Figure 15. Choose "EXF Graphical View" to view a screen output like Figure 16 (in Excel format).

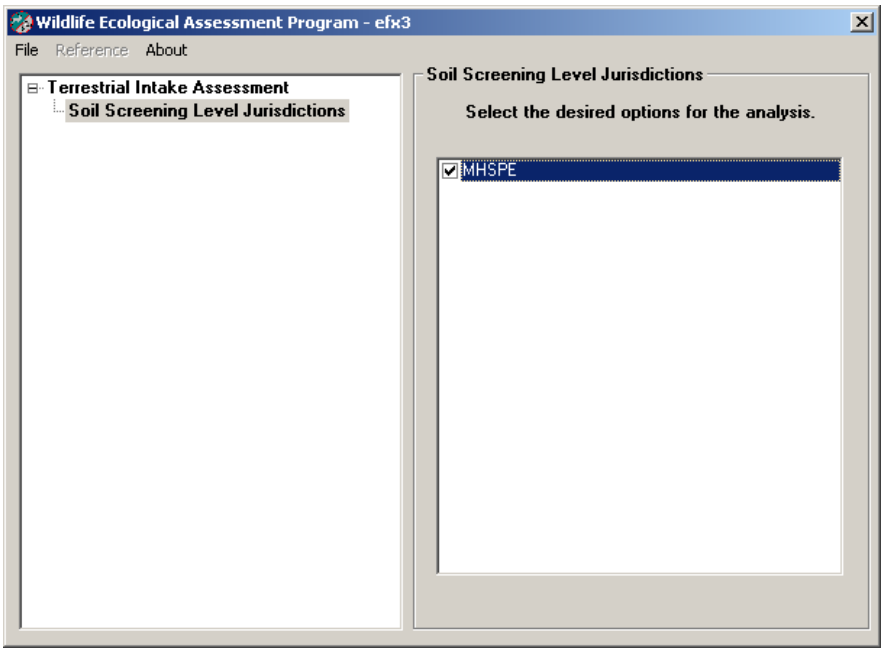

Figure 14. Wildlife Ecological Assessment Program

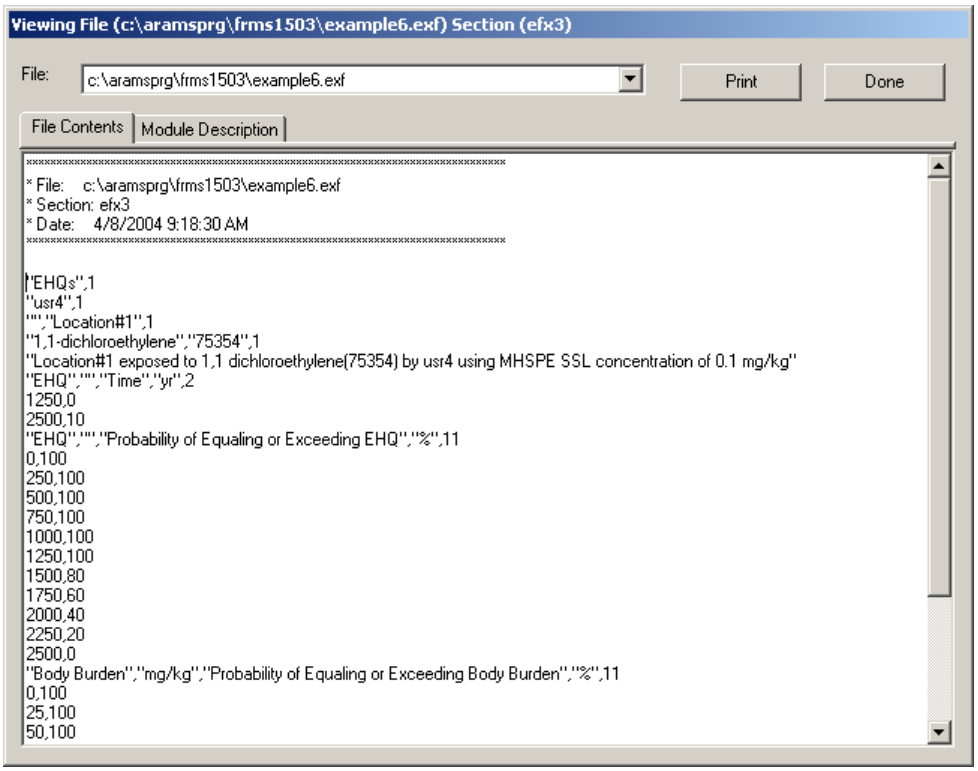

Figure 15. Eco Health Effects Output (text view)

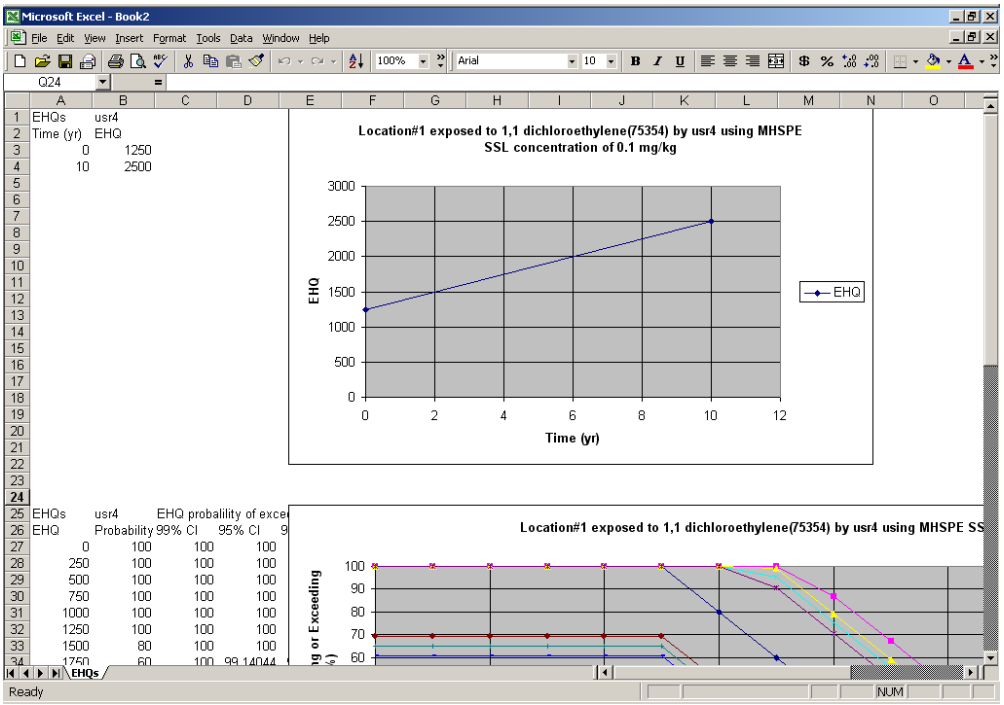

Figure 16. Eco Health Effects Output (Excel format)